

*The Institute for Advanced Technology*

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## DATA COMMUNICATIONS SYSTEMS

This seminar is intended for the data processing man who is preparing for an on line, real time or other system, which involves data communications. The seminar is designed as an orientation to the hardware and software considerations important to successful systems design and to data communications concepts and terminology.

Whether you are now involved in decisions about data communications, or simply realize your need to bone up on this rapidly growing aspect of the data processing business, the "Data Communications Systems" seminar is important to you. Though it will not turn you into a communications engineer, it will enable you to talk to one knowledgeably.

THE THIRD GENERATION OF COMPUTERS HAS ARRIVED. Literally thousands of the new model machines have been installed across the country. This new equipment is distinguished from the preceding two generations by many significant features. Of these, perhaps the most important is the ability to receive and send large quantities of data from remote locations. This facet of the third generation computer in effect adds a new dimension to the tasks of the systems planner and programmer which is usually described under the heading of "Data Communications." To make these new systems work properly, a knowledge of data communications equipment and techniques is now a "must."

JOSEPH E. HANNAH served as a communications officer in the Department of the Air Force and was involved in the design and implementation of the Air Force Global Communications System. Upon leaving the Air Force he joined Western Union as the Director of Communications Systems Development where he was directly involved in the design and implementation of the Department of Defense AUTODIN System and the General Services Administration Advanced Record System as well as other government and industry systems. He later joined Control Data Corporation as Manager of Government Communications Systems. Mr. Hannah is presently the Manager of the CDC Communications District. In this capacity he is involved in the design and implementation of message entry, switching and source data collection systems involving the integration of communications and data processing devices into a common system.

DONALD A. GLOIN is Director of Technical Operations, MAC Division, CDC. He previously was Supervisor of Training Department for NORAD and has held technical positions with RCA, Burroughs, and Norelco. Mr. Gloin was a Professional Lecturer and Associate Staff Member, University of Western Ontario from which he holds a B.A. degree in Business Administration. Mr. Gloin was also Lecturer and Staff Member of Ryerson Institute of Technology.

WILLIAM D. SKEES is Applications Staff Specialist for the Conversational Systems Development Department of the Data Centers Division Technical Staff of C-E-I-R/CDC. He is currently heading the project for Compilers and Languages in this department. Prior to joining C-E-I-R he was Manager of Systems and Operations at the University of Kentucky. He has been a consultant in teleprocessing at L'Ecole Polytechnique de l'Université de Lausanne, in Switzerland, and has done other telecommunications consulting in the U.S. Mr. Skees holds an M.S. in mathematics from the University of Illinois, and an A.B. degree in mathematics and psychology. He has also done graduate work in clinical psychology.

## Registration

Tuition, including course material and luncheons, is \$195 for the first student and \$175 for each additional student from the same organization. Checks for tuition should be made payable to the Institute for Advanced Technology. Special rates are available to organizations wishing to utilize IAT seminars on a contractual basis.

## Location — Accommodations

Seminars are conducted at the hotels listed below. Cost of hotel rooms are not included in the tuition but we will make reservations for you if requested. Please use the registration card to indicate accommodations desired. (Hotels will hold a block of rooms for seminar participants until two weeks before the seminar).

December 4-6 and January 20-22

**Sheraton-Silver Spring**

8727 Colesville Road

Silver Spring, Maryland 20910

Room rates: Single \$13.00 Twin \$18.00

February 17-19

**The Park-Sheraton Hotel**

7th Avenue & 56th Street

New York, New York 10019

Room Rates: Single \$15.00 Twin \$20.00

The Sheraton-Silver Spring is a mile from the Capital Beltway and is only minutes from downtown metropolitan area. The hotel is serviced by direct limousine to Washington airports. Free parking is available to seminar participants.

## Over 30 Courses Available

in 2 to 5 day seminars

Seminars are offered at various cities throughout the country. Private, in-plant sessions can also be arranged. A sampling of seminars currently scheduled:

**EDP Personnel Management for the Line Manager**

December 2-3, Los Angeles

**Microfilm Information Systems**

December 11-13, Washington, D.C.

**Production Planning, Scheduling and Control**

December 12-13

## COURSES FOR 1969

**Computer Graphics**

**Introduction to Operations Research**

**Model Building in Economics and Industry**

**Optical Character Recognition**

**Process Control**

For outlines, or to be placed on the mailing list for future announcements, write:

## REGISTRAR

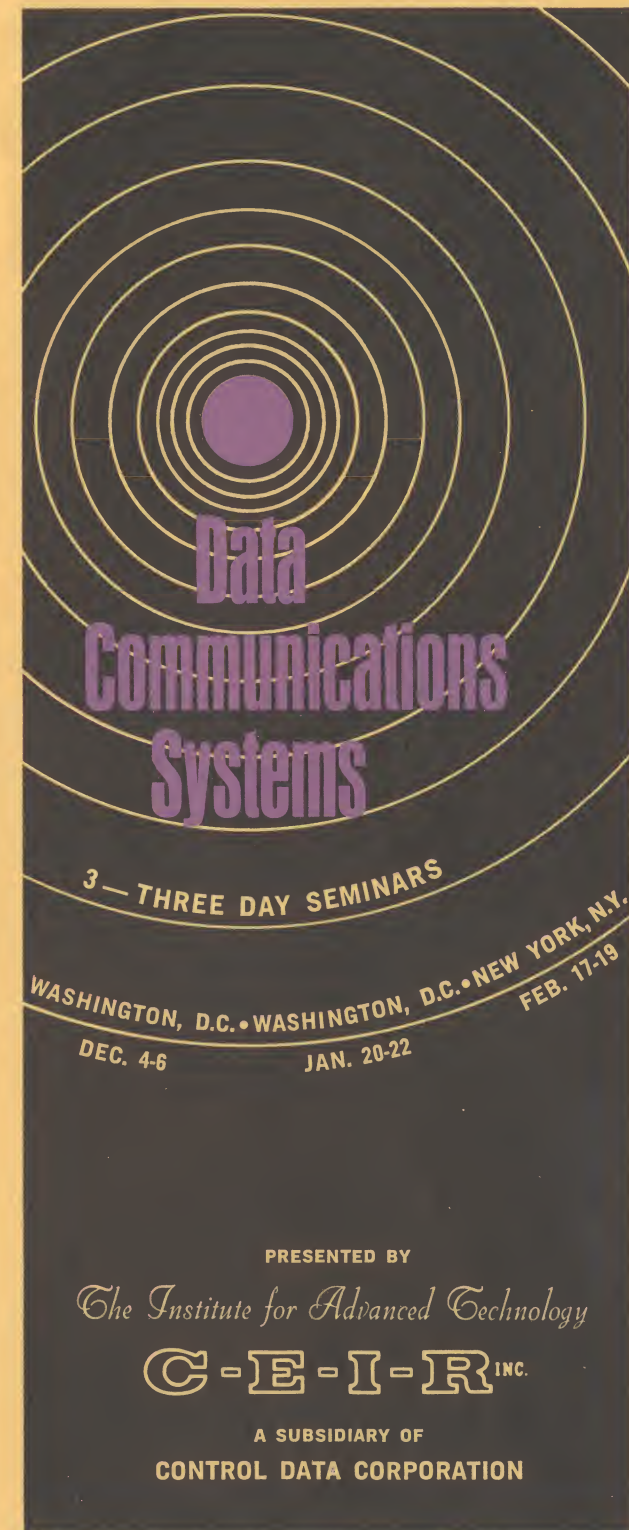
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**Data  
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## 1. Introduction

A brief review of the history and development of data communications.

The growing inter-relationship between communications and data processing.

Future trends in technological development.

Present and anticipated applications involving communications.

A brief review of commonly used definitions in data communications.

## 2. Numbering Systems And Data Codes

How is data encoded for transmission and what factors should affect selection of a code?

## 3. Communications Media

A. Principles of Data Transmission, Band Width and Channel Capacity, Signal to Noise Ratio.

B. Transmission Media, Cable and Microwave, Communications Satellite.

## 4. Error Detection and Correction

The philosophy and economics of error control, techniques of error detection and correction. What should the system designer look for?

## 5. Types of Service

A. Low Speed Lines (Teletype)

B. Voice Grade

C. Broadband Transmission

D. Private Wire Vs. Switched Services

E. Data-Phone Service (A Registered Service Mark of the Bell System)

F. WATS

G. Half and Full Duplex

## 6. Data Terminal Devices

A. Low Speed, Hard Copy Terminals

B. Cathode Ray Tube Displays (Keyboard Controlled)

C. Optical Character Readers and Their Use

D. Programmable Devices

## 7. Common Carriers and Regulatory Agencies

# AN OUTLINE OF SUBJECTS COVERED IN OUR DATA COMMUNICATIONS SYSTEMS SEMINAR

## 8. Characteristics of Data Communications

A. System Costs

B. Required Analysis

C. System Design

D. System Integration

## 9. Hardware Considerations

A. Computer Interface

(1) Data Characteristics

(2) Hardware Interrupt Characteristics

B. Introduction to Specific Types of Hardware

(1) 360/30, 40/Spectra 70

(2) B3500

(3) SDS 940

(4) Sigma 7

(5) GE 430

(6) CDC 6600

## 10. Desired Hardware Capabilities

A. Hardware

(1) Multiple Simultaneous Line Servicing (I/P)

(2) Identification of I/P

(3) Acceptance of Raw Data

(4) Assembly of Raw Data

(5) Identification of Refined Data

(6) Processing of Refined Data

(7) Identification of O/P

(8) Disassembly of Processed Data

(9) Multiple Simultaneous Line Servicing  
O/P and ADO

(10) Fail Safe

B. Facility

(1) Power Back Up

(2) Restart

(3) Security

## 11. Implementation (Hardware)

A. Time Servicing Techniques

(1) Bit Buffer

(2) Serial to Parallel Conversion

(3) Identification of Control Characters

(4) Word Formation

B. Message Servicing

(1) Storage

(2) Recognition of Systems Commands

(3) Implementation of Systems Commands

C. Task Servicing

(1) Time Slice

(2) Priorities

(3) Memory Allocation and Reallocation

(4) Memory Protection

(5) Executive Overhead

(a) Core

(b) Time

(6) I/O Overhead

D. Interrupts

(1) Processor

(2) I/O

E. Interrelationship of A through D

(1) Implications

(2) Limitations

## 12. Hardware Selection

A. Raw Memory Speed and Effective Utilization thereof

B. Effective M/P Capability

(1) Dynamic Memory Reallocation

(2) Memory Protection

C. Automatic Restart on System Abort

D. Automatic Restart on Hardware/Power Failure

E. Graceful Degradation

F. Real Time Clock

G. Acceptance of Nonstandard Lines

(1) Broad Band

(2) M/P

(a) Time

(b) Frequency

## 13. Software Considerations

Introduction to Concepts of Programming for Data Communications

## 14. Programming For Message-Handling Applications

A. Multiplexor-Oriented Systems

B. Stand-alone Communication Processor Systems

C. Manufacturer-Supplier Generalized Systems for Message-Handling

D. User-Writer Systems

## 15. Applications Programming For Data Communications

A. Interface with Operating System

B. Storage Organization Considerations

## 16. Special Considerations For Time-Sharing Systems

## 17. Implementation Considerations

How do real time systems differ from conventional applications?

## 18. Case Study Descriptions

## 19. Summary. Question and Answer Period

The right to cancel the seminar or to amend the syllabus is reserved.

**Consulting Services** — Participants in the Data Communications Systems seminar may submit written questions, during the seminar or at a future date, on subjects covered in the seminar and receive written replies at no additional cost.

CLASSES BEGIN AT 9:00 A.M. AND END AT 5:00 P.M.

REGISTER ME FOR:

\_\_\_\_\_  
(seminar title)

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(place of seminar)

\_\_\_\_\_  
(date of seminar)

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633